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ABSTRACT

Freshmen placed into the second or third quarter of the first year calculus sequence at the University of Washington were studied. Two major findings were: freshmen eligible for advanced placement earned mean mathematics Grade Point Averages (GPAs) which were quite high; and advanced placement students earned mean mathematics GPAs substantially higher than the corresponding "average" total group in all mathematics courses. The most superior performance in terms of mean mathematics GPA were those students eligible for advanced placement in the third course in the sequence. Data proved sparse for certain College Entrance Examination Board (CEEB) score subgroups, but information about the Autumn Quarter 1977-79 freshmen calculus students is provided. (MP)

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CEEB Advanced Placement Mathematics Examination Results and Performance in First-Quarter UW Calculus Course

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All freshmen (N = 105) entering the University of Washington (UW) in Autumn Quarters of 1977, 1978, and 1979 who were eligible for advanced placement into either the second or third quarter of the first-year UW calculus sequence (Mathematics 125 or Mathematics 126, respectively) were studied. The current report profiled the relationship between CEEB Advanced Placement Mathematics scores and first-quarter mathematics performance. The most noteworthy result concerned the superior performance of UW advanced placement students when compared with an "average" group. Employing the total autumn 1979 group of freshmen and sophomores as the standard of comparison, regardless of the initial UW mathematics course taken, advanced placement freshmen earned mean mathematics GPAs which were substantially higher than the corresponding means for the comparison group. For example, freshmen who were eligible for placement into Mathematics 126, and who enrolled in Mathematics 126, earned a mean GPA of 3.58 in this course versus 2.49 for the total freshman-sophomore group having completed Mathematics 126 in autumn 1979.

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CEEB Advanced Placement Mathematics Examination Results and Performance in First-Quarter UW Calculus Course

During the 1979-1980 academic year the University of Washington (UW) noted a substantial rise in the number of freshmen submitting College Entrance Examination Board (CEEB) Advanced Placement examination scores, that is, there was nearly a 30% increase over the 1978-1979 academic year (University of Washington, Office of Admissions, Note 1). The current report focuses on one of these examinations, the CEEB Advanced Placement Mathematics test, in order to investigate the relationship between scores achieved on this CEEB examination and performance in the initial mathematics course taken during the first quarter at the University. However, before proceeding with the analysis, the present UW policy should be detailed.

There are two forms of the CEEB Advanced Placement Mathematics examination, Calculus AB and Calculus BC, both of which have scores ranging from a high of 5 to a low of 1. Calculus BC is an expanded version of Calculus AB, that is, it requires additional knowledge of calculus (College Entrance Examination Board, Note 2). Advanced placement into a UW calculus course is available for those achieving a score of 3 or higher on either Form AB or BC as follows. Students achieving a score of 5 on either Form or a score of 4 on Form BC are placed into Mathematics 126 (the third quarter of the first-year calculus sequence) with credit awarded for Mathematics 124 and 125 (the first two courses in the calculus series) only upon successful completion of Mathematics 126. Students with a score of 3 on either Form or a score of 4 on Form AB are placed into Mathematics 125 with credit awarded for Mathematics 124 only upon successful completion of Mathematics 125.

The intent of this brief report is twofold and can be addressed by posing two questions. First, in what mathematics courses do advanced placement entrants actually enroll during their first quarter at the University? How well do advanced placement students do in comparison to "average" students having taken the same course?

Method

Sample. The distribution of students entering the University of Washington between Autumn Quarter 1977 and Autumn Quarter 1979, inclusive, and having CEEB Advanced Placement Mathematics scores of 3 or higher (N = 110) is presented in Table 1, separately for each quarter and sending source. The majority of students entered in autumn of 1977, 1978, or 1979 directly from high school (N = 105) and this group comprised the sample to be profiled in the current report.

Table 1

University of Washington Entrants Between Autumn 1977 and Autumn 1979, Inclusive, Submitting CEEB Advanced Placement Mathematics Scores, Separately by Quarter and Sending Source

Quarter of Entry	Number from Sending Source		
	High School	Collegiate Transfer	Total
Autumn 1977	22	1	23
Autumn 1978	35	-	35
Summer 1979	1	-	1
Autumn 1979	48	3	51
Total N	106	4	110

Note. Only those students having earned a score of 3 or higher on either Calculus AB or Calculus BC of the CEEB Advanced Placement Mathematics examination are included.

Variables. For each student the following information was collected from their permanent records: sex, first-quarter mathematics courses and grade point average (GPA) in that course, and first-quarter cumulative UW GPA.

Results

Table 2 presents the number of males and females eligible for UW advanced placement, separately for each CEEB Advanced Placement Mathematics group. The bulk of students (N = 88 or 84%) were eligible for advanced placement into Mathematics 125, the second quarter course in the calculus sequence. The majority of freshmen eligible for advanced placement in mathematics were males (N = 83 or 78%). For the total female group (N = 23) only 1 was eligible for advanced placement into Mathematics 126.

Table 2

Numbers of Males and Females Eligible for Mathematics Advanced Placement, Separately by CEEB Advanced Placement Group

CEEB Calculus Form and Score	Male N	Female N	Total N
Eligible for Placement into Mathematics 126			
Form AB, Score 5	11	-	11
Form BC, Score 4	3	1	4
Form BC, Score 5	3	-	3
Total N	17	1	18
Eligible for Placement into Mathematics 125			
Form AB, Score 3	36	10	46
Form AB, Score 4	22	7	29
Form BC, Score 3	7	5	12
Total N	65	22	87

Table 3 presents the breakdown of the total group eligible for advanced placement into Mathematics 125, separately by CEEB group. The

three CEEB groups (Form AB score 3, Form AB score 4, and Form BC score 3) did not differ greatly in mathematics performance and, therefore, only the total group will be discussed. Overall, the bulk of students (N = 40 or 46%) enrolled in Mathematics 125 with nearly equal proportions (c. 14%) in each of four courses: Mathematics 124, Mathematics 126, Mathematics 134 (the honors section of Mathematics 124), and those who did not take mathematics during their first quarter at the UW. The mean (M) mathematics GPA earned in each course was: Mathematics 124, M = 3.71; Mathematics 125, M = 3.43; Mathematics 126, M = 2.73; and Mathematics 134, M = 3.35. Regardless of the initial calculus course among 124, 125 or 126, advanced placement freshmen earned mathematics GPAs which were substantially higher than "average." That is, using the data for Autumn Quarter 1979 as the standard of comparison, mean GPAs for the total freshman-sophomore group versus the corresponding advanced placement group were: Mathematics 124, 2.44 vs. 3.71; Mathematics 125, 2.46 vs. 3.43; and Mathematics 126, 2.49 vs. 2.73. In the comparison for Mathematics 134, the difference was not as great with the "average" mean GPA equal to 3.14 and the advanced placement GPA 3.35.

Table 4 is analogous to Table 3, presenting the breakdown of students eligible for advanced placement into Mathematics 126. The largest number of students in this group (N = 7 or 39%) enrolled in Mathematics 134, the honors section of Mathematics 124, with the remainder enrolled as follows: 4 took Mathematics 124, 5 Mathematics 126, 1 Mathematics 238 (Elements of Differential Equations), and 1 did not take mathematics during the first quarter. Since few students presented results from Calculus BC (total N = 7 with 4 having earned a score of 4 and 3 a score of 5), summary statements must be based on the total group. Regardless of the particular course taken during the first quarter, all students did exceptionally well in mathematics with mean GPAs ranging from a low of 3.58 for Mathematics 134 to a high of 4.00 for both Mathematics 125 and 238. In comparing the performance of students in Tables 3 and 4, the mean GPAs for Table 4 surpassed the corresponding means in Table 3, as might be expected, since those included in Table 4 were initially better qualified for advanced placement.

Table 3

First-Quarter Mathematics Placement for Entrants Earning CEEB Advanced Placement Mathematics Scores Eligible for Placement in Mathematics 125, Separately by CEEB Examination

First Course Taken	CEEB Form AB, Score 3			CEEB Form AB, Score 4			CEEB Form BC, Score 3			Total		
	N	GPA Math	GPA Cum	N	GPA Math	GPA Cum	N	GPA Math	GPA Cum	N	GPA Math	GPA Cum
None	9	--	3.30	3	--	3.48	--	--	--	12	--	3.34
124	7	3.63	3.47	1	4.00	3.80	3	3.80	3.57	11	3.71	3.53
125	22	3.16	3.05	14	3.73	3.55	4	3.83	3.53	40	3.43	3.27
126	4	2.93	3.28	4	2.75	2.90	5	2.56	2.91	13	2.73	3.02
134	4	3.25	2.82	7	3.40	3.31	--	--	--	11	3.35	3.13
Total N	46			29			12			87		

Table 4

First-Quarter Mathematics Placement for Entrants Earning CEEB Advanced Placement Mathematics Scores Eligible for Placement in Mathematics 126, Separately by CEEB Examination

First Course Taken	CEEB Form AB, Score 5			CEEB Form BC, Score 4			CEEB Form BC, Score 5			Total		
	N	GPA Math	GPA Cum	N	GPA Math	GPA Cum	N	GPA Math	GPA Cum	N	GPA Math	GPA Cum
None	1	--	3.33	--	--	--	--	--	--	1	--	3.33
124	--	--	--	--	--	--	--	--	--	--	--	--
125	2	4.00	3.99	1	4.00	3.34	1	4.00	3.82	4	4.00	3.79
126	2	3.65	3.34	2	3.35	3.11	1	3.90	3.97	5	3.58	3.37
134	6	3.62	3.42	1	4.00	4.00	--	--	--	7	3.67	3.50
238	--	--	--	--	--	--	1	4.00	3.86	1	4.00	3.86
Total N	11			4			3			18		

Summary

Data is sparse for certain CEEB Advanced Placement Mathematics subgroups, e.g., Calculus BC, Score 5 (N = 3). Overall, two points seem noteworthy:

(1) Freshmen eligible for advanced placement earned mean mathematics GPAs during their first quarter which were quite high. For ex., for those eligible for advanced placement into Mathematics 125 the mean GPA was 3.43, while for those eligible for advanced placement into Mathematics 126 the mean GPA was 3.58.

(2) Advanced placement students earned mean mathematics GPAs substantially higher than "average." That is, using the total group of freshmen and sophomores having completed the same course in autumn 1979 for comparison, advanced placement students outperformed the corresponding "average" total group in all first-quarter mathematics courses, and the more superior performance was noted among those eligible for advanced placement into Mathematics 126.

Reference Notes

1. University of Washington, Office of Admissions. UW Memo from Admissions, October 1979, 4 (2).
2. College Entrance Examination Board. 1976-77 Advanced Placement Mathematics. Princeton, NJ: College Board Publication, 1976.